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Experienced Impacts of Mining in Sodankylä
Follow-up Study

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2021

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Contents

1 Introduction

This research report deals with Sodankylä residents' views and experiences concerning mining. The residents assess the operations of the local mining companies and the regulatory control of mining as well as the impacts of mining on life, the environment and other livelihoods In Sodankylä.

This is the third time the survey has been conducted. It was first conducted as a part of the REGINA project between the years 2015–2018. The objective of the project was to improve the ability of sparsely populated areas to gain from large-scale natural resources projects. The project was led by the Nordic research centre Nordregio and it was funded through the Northern Periphery and Arctic programme. Sodankylä Municipality and the university of Lapland took part in the project.

A random sample postal survey on the experienced impacts of mining was conducted in 2016 through the REGINA project, and it was repeated as an open online survey in 2018. The research reports functioned partly as a basis for the mining programme of Sodankylä Municipality in which it was determined to repeat the survey regularly in the future (Sodankylän kunta 2018).

We talk about experienced impacts of mining because every respondent had a chance to share their personal experiences and assess the social impacts of mining from their own perspective. The social impacts of mining can be positive or negative and they may cover many areas of life: employment, amenity of the locality and the living conditions, sense of community, well-being of locals as well as place experience and identity. An example of a direct and immediate impact would be getting employed by a mining company, whereas a growing demand for wellness services and a boost in trade would count as indirect impacts (see e.g. Sairinen & Kohl 2004; Vanclay & Esteves 2011; Kunnari et al. 2018; Vanclay et al. 2015; Suopajärvi & Sairinen 2016).

The first part of this report deals with the impacts of mining on the amenity of the locality and the services and infrastructure of Sodankylä. After that, the perceived environmental impacts and impacts on other livelihoods are reported. The second part deals with the residents' attitudes towards mining, their views on regulatory control and the acceptability of the ongoing mining projects in the municipality.

The research is based on a survey for municipal citizens and therefore the data were analysed as a whole without making distinctions between the different demographic profiles of the respondents. The only exception is the analysis of the perceived environmental impacts and impacts on the amenity of the locality and services, which were analysed based on the place of residence. In doing so, the respondents were divided into three groups based on where they live: the municipal centre, the nearby villages of an ongoing or planned mine and other villages.

The data were collected through an online survey that was published on the official website of Sodankylä Municipality in February 2021. The data was analysed, and the project report was written during late spring and early summer 2021. The research was funded by the mining companies currently operating in Sodankylä: AA Sakatti Mining Oy, Boliden Kevitsa Oy and Rupert Resources Oy. Sodankylä Municipality took part in the project.

2 Research material and methods

The research was carried out as an open online survey between 22 February and 22 March 2021. The link to the survey was published on the official website of Sodankylä Municipality and it was promoted on the municipality's Facebook page, on two different local Facebook forums and in the Sompio newspaper.

We received 297 responses, which is significantly more than in the previous years. The 2016 postal survey received 200 responses and the 2018 follow-up study received 160 responses. The survey consisted of both quantitative and qualitative items. The responses to the qualitative items, i.e. open-ended questions, amounted to 60 pages of written experiences of and views on mining and Sodankylä. Some of those responses are cited in this report.

There is not a straightforward explanation for the increase in the number of responses. One contributing factor may be that the assessment of the environmental effects of the planned Sakatti mine was completed right before the data was collected, whereby the mining project became more concrete for the locals. This may have raised general interest towards mining and activated local discussion on the topic as well. Also, many of the respondents worked in the mining industry, which means that the survey promotion done by the mining companies and the workers' interest towards their own industry may have prompted them to participate in the survey. Promotion through social media and networks of the local youth increased the number of young respondents (n=36). The survey may also have been perceived as familiar, as it was carried out for the third time within a few years.

The current survey form is largely identical to the one used in the 2018 follow-up study. Because the quality and prices of apartments and property were deemed problematic in the former research, they were now investigated more thoroughly with statements about the selection, quality and prices of both apartments and property. From the matrix measuring the perceived environmental impacts, "radiation" was removed because it cannot be detected without equipment. Also, the current mining projects in Sodankylä do not cause radiation. Several statements measuring attitudes towards mining were added as well as the possibility to give development proposals to the mining companies.

The analysis focused on how the responses were distributed between different response options. Some matrices were cross-tabulated with the place of residence in order to bring out the regional differences in attitudes and experiences. The analysis is therefore descriptive in nature. The results are presented both in writing and graphically using diagrams. Percentages without parentheses have been rounded out to the closest integer, but the exact figures can be seen in the graphs.

For the regional analysis, the respondents were divided into three groups based on the place of residence: the municipal centre, nearby villages of an ongoing or planned mine and other villages. The nearby villages of the ongoing or planned mines will be referred to as "nearby villages", which

were as follows: Moskuvaara, Petkula, Rajala, Sattanen, Kersilö, Kelujärvi, Siurunmaa and Puolakkavaara.

Due to the way the data was collected, the results of the analysis are not statistically generalisable. Generalisation would require a random sample. In an open online survey, the researcher cannot affect the way in which the sample becomes selected. On the other hand, even random samples can be skewed because not all people that are selected will respond to the survey. In the section *Basic information of the respondents* the sample will be compared to the overall population of Sodankylä through demographic variables such as age, socio-economic status and career fields. When the differences in the social variables between the sample and the base population are taken into account, the results can be interpreted as indicative of the local people's views on Sodankylä and the impact mining has on the locality.

2.1 Basic information of the respondents

The gender distribution of the respondents was very even: there are 50 percent of women and 48 percent of men in the sample, while 3 percent chose the option 'Other/do not want to respond'. Compared to the general Sodankylä population, the sample has an over-representation of young and middle-aged adults. The difference was most significant in the age groups 30–39 (10.4 percentage points) and 40–49 (12.6 percentage points). The share of people aged 70–79 is 5 percentage points lower than in the base population. In all age groups under 50 the share of women was almost 60 percent, while in the age groups over 60 their share was under 35 percent. (Statistics Finland, 11rf.)

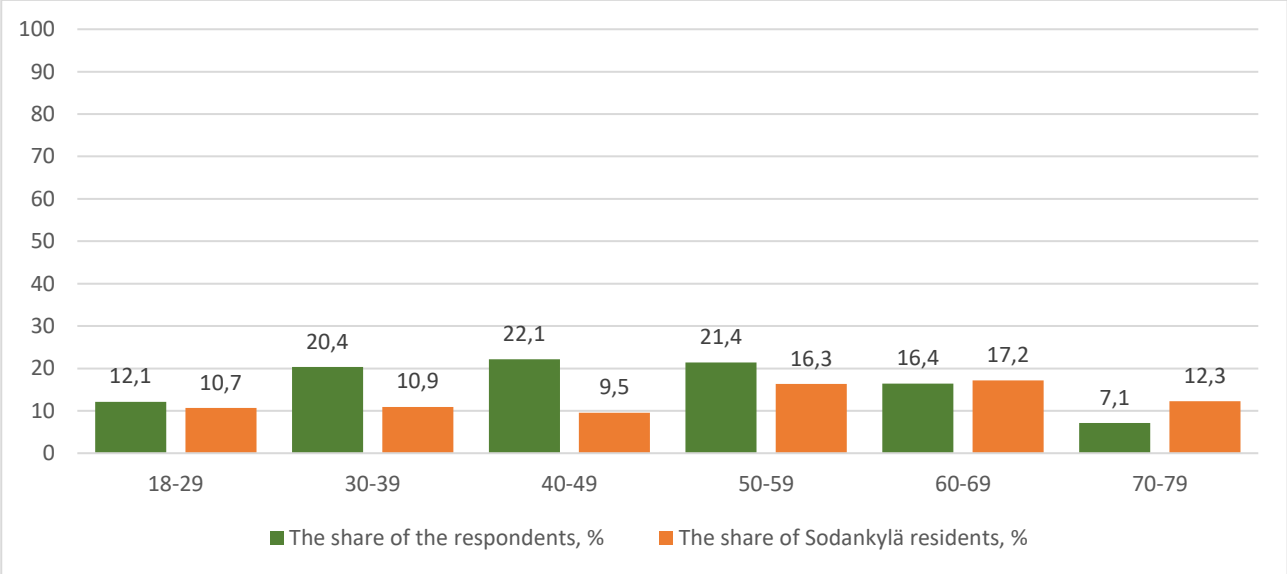

Figure 1 Age distribution of the respondents and Sodankylä residents (2019), %

Nearly two-thirds (63.3%) of the respondents lived in the municipal centre, every sixth (16.8%) respondent in the nearby villages and every seventh respondent (14.1%) in the other villages. The survey was successfully targeted at the Sodankylä residents, since only a very small portion (2.4%) of the respondents lived outside Sodankylä and only 3 percent did not share their place of residence.

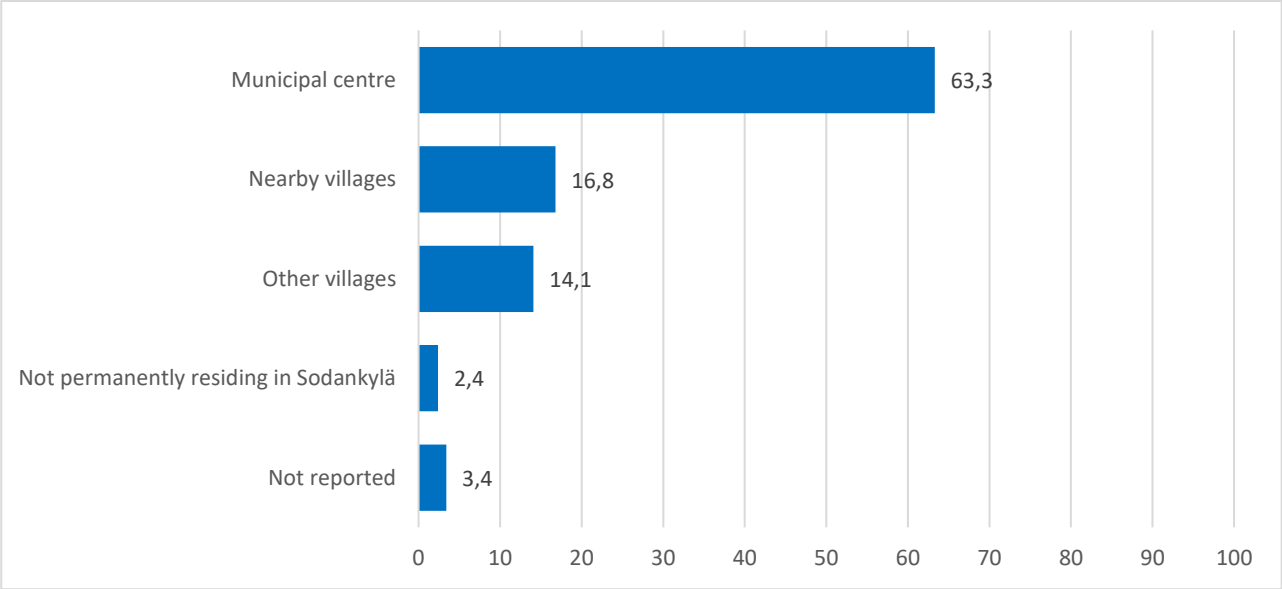

Figure 2 Location of the place of residence, %

A vast majority of the respondents (77.4%) were employed, while their share was slightly more than two-fifths (43.5%) of the population of Sodankylä. A bit less than a sixth (15.5%) of the respondents were retired, which is less than half of their share of the Sodankylä population (32.8%). Students made up 4 percent of the respondents, which corresponds to their share of the base population. The portion of unemployed respondents was only 1 percent and therefore they are under-represented in the sample. (Statistics Finland, 115b.)

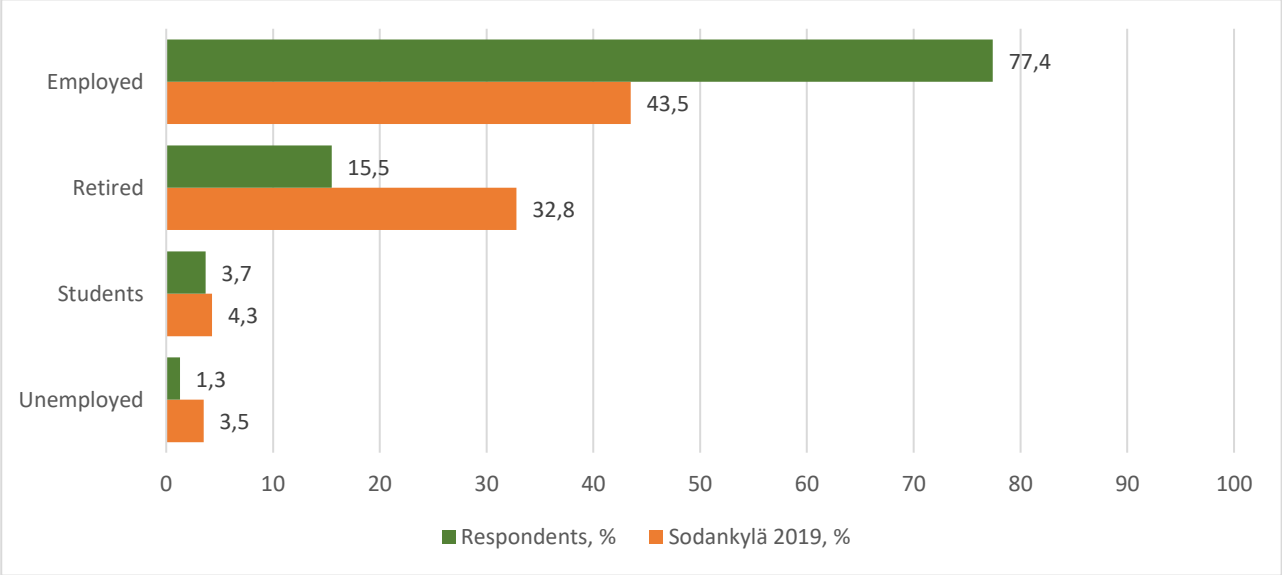

Figure 3 Socio-economic status of the respondents and Sodankylä residents (2019), %

Examining the distribution of employed respondents across different career fields shows that the share of respondents working in the mining industry is over twice their share of the employed population of Sodankylä. Slightly more than one-tenth (11.3%) of employed Sodankylä residents worked in the mining industry in 2018, while in the sample their share is a bit over one-fourth (28.2%). Those working in public administration were also slightly over-represented in the sample,

whereas social and health sector workers were under-represented. Otherwise, the sample corresponds to the employed base population's distribution across different career fields. (Statistics Finland, 115i.)

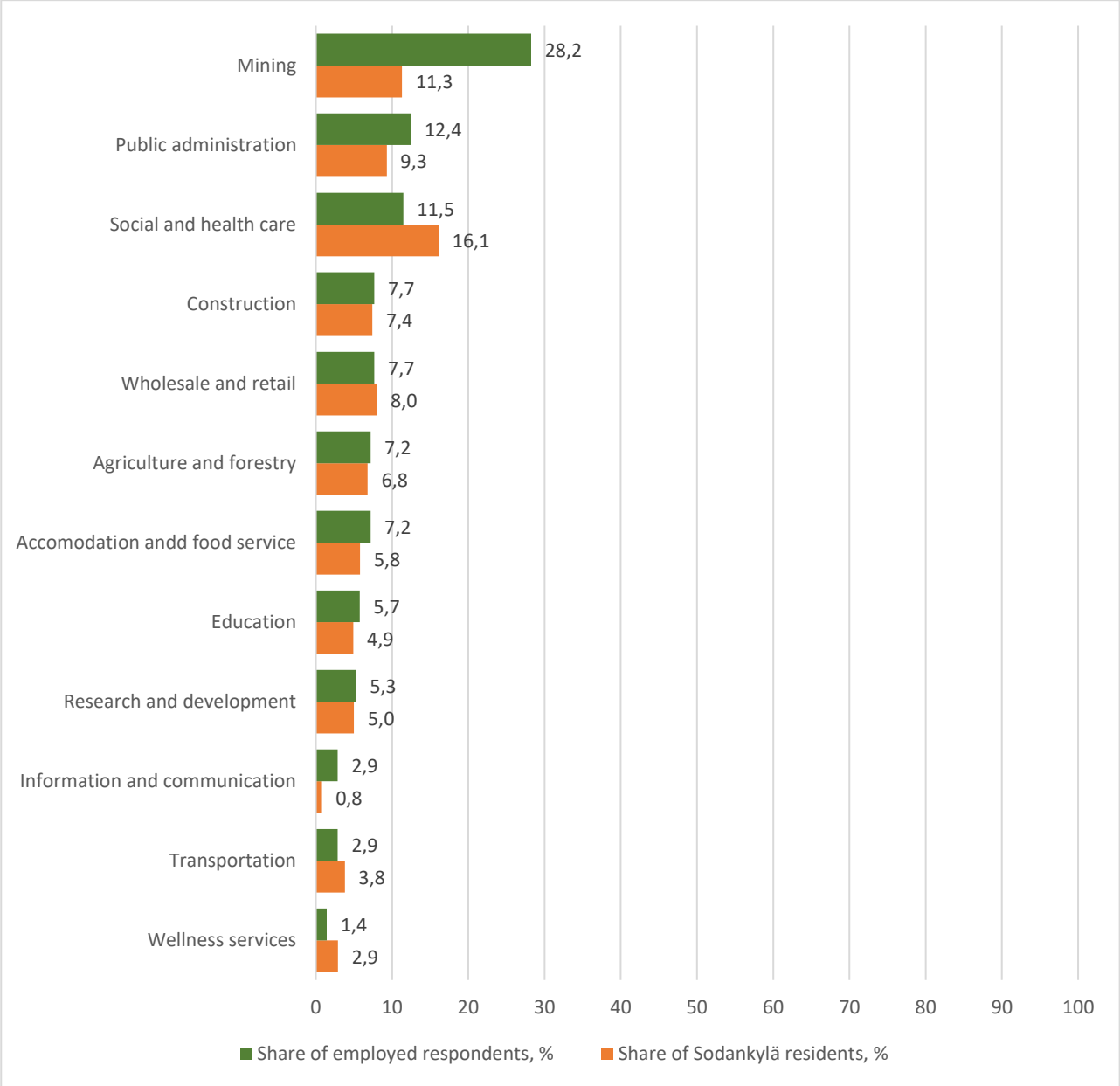

Figure 4 Employed respondents and Sodankylä residents (2018) by industry, %

3 Experienced impacts of mining

3.1 Attractiveness, services and infrastructure

The respondents considered Sodankylä an attractive and safe place to live, they regarded the environment as clean and most of them had good social networks in the area. On the other hand,

the assessments were more negative across all items compared to the 2018 study. The greatest differences concerned the respondents' views about the atmosphere in Sodankylä, their opportunities to participate in municipal affairs and their opportunities to influence municipal affairs and the image of the municipality, in all of which the share of positive evaluations dropped more than 20 percentage points.

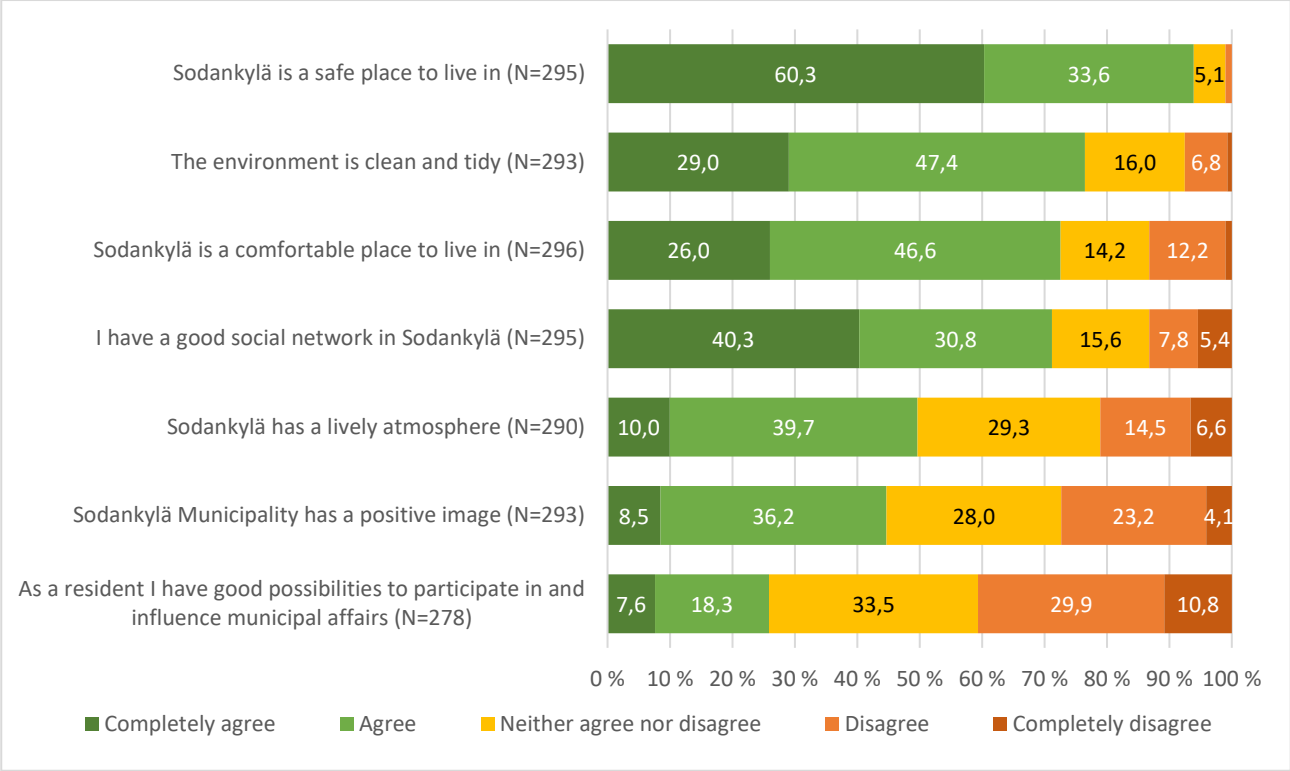

Figure 5 General attractiveness

A vast majority (72.6%) of the respondents considered Sodankylä a comfortable place to live. However, their portion decreased from the previous study, in which the share of those who considered Sodankylä a comfortable locality was 8 percentage points larger. The experiences about safety did not change much, as analogously to the 2018 survey, the majority (93.3%) considered Sodankylä a safe place to live in. The environment was deemed clean and tidy by 76 percent of the respondents, while in 2018 the figure was 86 percent.

The image of the municipality was considered positive by 45 percent of the respondents, while previously 66 percent made that assessment. The respondents thought that among other things, the municipal image had suffered from poor fiscal choices and municipal policy, which was characterised as "suhmurointi" (a colloquialism for *conniving*) by one respondent. Those who were critical about the mining industry also felt that it impaired Sodankylä's image. The increasingly tense political atmosphere may also have affected the assessments on Sodankylä's atmosphere as a whole. Half (49.7%) of the respondents felt that Sodankylä had an active atmosphere, while in 2018, 70 percent thought so. The advancement of development projects and new ideas was considered to have suffered from bickering between the decision makers. Opinions on the liveliness of the atmosphere may also have been affected by the fact that the respondents also felt that the place

had become quieter and that the municipal centre lacks urban services such as restaurants. The decreased number of brick-and-mortar establishments was also mentioned to have negatively affected the attractiveness of the locality.

The opportunities to participate and influence municipal affairs were deemed weak. Only every fourth (25.9%) respondent felt their opportunities were good, while almost half (48.8%) of the respondents in 2018 felt that they could participate and influence the affairs of Sodankylä Municipality. In addition, the share of those who felt their opportunities were weak increased from previous 29 percent to 40 percent. The experience of the political atmosphere being tense was reflected on the assessments about the opportunities to participate and influence. For example, the respondents felt that "the public opinion of the municipal residents is being overrun by disputes between the municipal decision makers" and that because of the political differences amongst the decision makers, "the municipal residents' opportunities to influence are miniscule".

The share of respondents that had a good social network in the locality was 71 percent, which is almost 10 percentage points less than in 2018 (80.5%). The Covid-19 pandemic restrictions may at least partly have caused the change in how the respondents viewed their social networks. While the data was collected, all public events with more than 20, and later 6, participants were forbidden in the Lapland Hospital District and restaurant activities were restricted as well (Regional State Administrative Agency for Lapland 2021 and Council of State 2021).

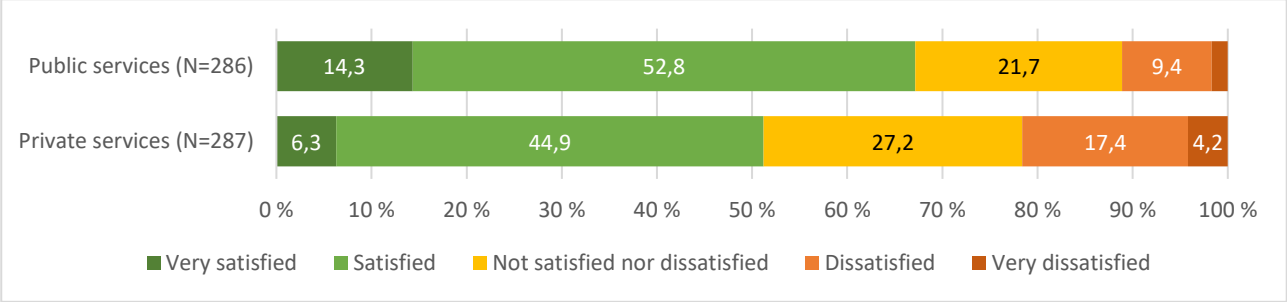

Figure 6 Satisfaction with public and private services

The respondents were quite satisfied with municipal services, which were considered good by 67 percent of the respondents. Slightly more than a half (51.2%) were satisfied with private services as well. However, compared to the 2018 study, satisfaction with services as a whole decreased slightly. The share of those who considered public services good decreased by 4 percentage points, while the decrease was 7 percentage points in the case of private services. Satisfaction with private services has been on a decline since the first survey. The difference between 2016 and 2021 is 26 percentage points, which can be considered a significant change. The growing dissatisfaction can at least partly be explained by the decreased number of brick-and-mortar establishments, an issue that came up already in the background conversations of the previous study. On the other hand, the respondents felt that mining had helped to maintain a higher level of services than would otherwise have been possible in Sodankylä.

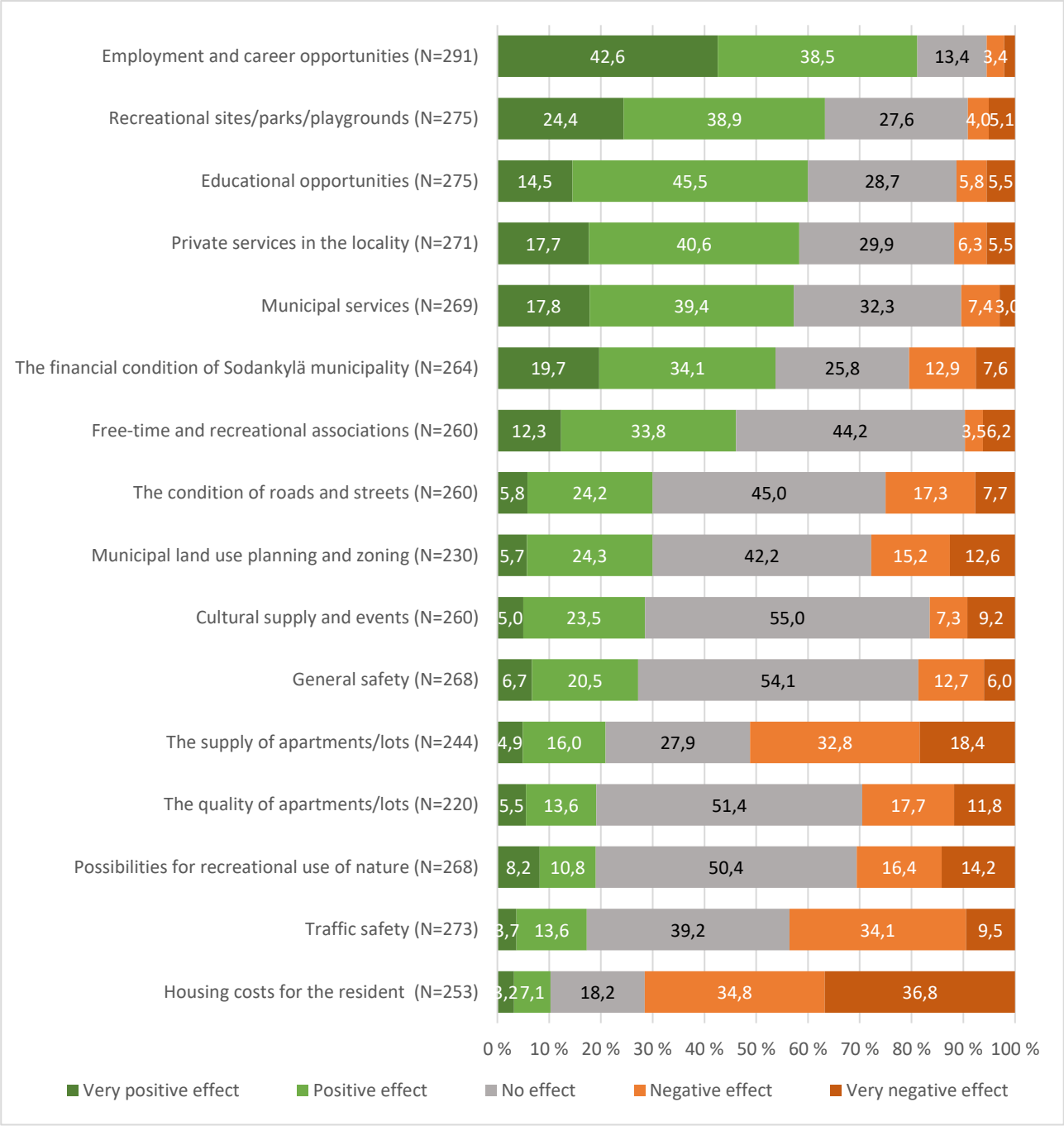

Figure 7 Effects of mining on the services, attractiveness and the infrastructure of the area

A clear majority of the respondents (81.1%) thought that mining had positively affected career and employment opportunities. As one responded described: 'A good opportunity, especially for young, educated adults, to get employed, advance one's career and find new social contacts. A reason to stay in Sodankylä.' A majority (60.0%) also thought that educational opportunities had improved, even though their share slightly decreased compared to previous survey (2018: 67.8%). On the other hand, a markedly larger share than before thought that mining had negatively affected educational opportunities (2018: 3.2%, 2021: 11.3%). In the open-ended answers, the respondents wrote that the supply of education in the area has become less versatile because of mining.

The impacts of mining on the financial condition Sodankylä Municipality were mostly (53.8%) regarded as positive, as well as the impacts on public (57.2%) and private (58.3%) services: 'Mining and mineral exploration has kept the municipality's level of services higher. There are several shops and even specialty stores.' However, compared to the previous study, a tenfold share of the respondents thought that private services have suffered from mining (2018: 1.9%, 2021: 11.8%). No clear explanation to the increased dissatisfaction with private services could be found in the data.

A majority (63.3%) of the respondents thought that recreational sites, parks and playgrounds had benefited from mining, whereas previously less than two fifths (37.0%) thought so. The change can partly be explained by the new ice rink, sponsored by Boliden Kevitsa Mining Oy, that was opened in Sodankylä after the previous study. As one respondent stated, 'The opportunities for physical activities are on a relatively good level, thanks to the sponsoring coming from the mining companies.' Free-time and recreational associations were considered to have benefited from mining by almost half of the respondents, which is a clearly larger share than previously (34.2%).

A little less than a third (30.6%) of the respondents felt that the recreational use of nature had suffered from mining, while a fifth (19.0%) thought that mining had benefited it. Based on the open-ended responses, the dissatisfaction arises from the expansion of the mining activities to recreational sites that are important to the locals and from the natural environment becoming polluted. On the other hand, some respondents did not consider the mining-related land use problematic because 'there are plenty of wildlands to wander around.'

Cultural supply and events were seen as benefiting from mining by a little less than a third (28.5%) of the respondents, which is a slightly larger share than previously (2018: 24.2%). The share of those who thought the cultural supply and events had suffered from mining was multiplied from the previous study's 3 percent to 17 percent in the current survey. No clear explanation to the increase was found in the analysis, but considering the opportunities for cultural activities, the respondents expressed discontent with the poor condition of cultural facilities as well as a limited selection of cultural events. The respondents also wished that the mining companies would participate more in the funding of cultural activities in the area.

Slightly less than a third (30.0%) of the respondents thought that the condition of roads and streets had improved because of mining, while a fourth (25.0%) thought the opposite. The share of both opinions increased from the previous survey, thus making the assessments more polarised. The share of those respondents who felt the condition of roads and streets had improved grew by 6 percentage points and the share of those who thought the opposite grew by 10 percentage points compared to the 2018 study. The respondents specifically linked the experienced decline in road conditions to increased heavy vehicle traffic that causes the roads to deteriorate. However, positive impacts were reported as well: 'The E75-road has better maintenance from the church to the Kevitsa intersection – that is a plus.' More than two-fifths (43.6%) of the respondents perceived road traffic safety to have decreased as a result of mining. The heavy vehicle traffic was linked to safety as well: 'Heavy truck traffic on Route 4 and a lack of stretches to pass are a safety risk in these driving

conditions.' A little less than a third (30.0%) of the respondents thought that the municipal land use planning and zoning had benefited from mining. Slightly more than a fourth (27.8%) deemed mining to have impeded planning and zoning, which is almost twice as many as in the previous study (2018: 14.6%).

As in the 2018 study, when asked about the impacts of mining on the services and attractiveness of the area, the effects on housing costs were deemed the most negative. The development of the housing costs for the residents was seen as negative by 72 percent and as positive by 10 percent of the respondents. Roughly a half of the respondents felt that mining had negatively affected the supply of apartments and/or property, which is a clear increase since the previous study (2018: 35.7%). On the other hand, a fifth (20.9%) of the respondents thought that mining had improved the supply. The quality of apartments and/or property was thought to have improved as an effect of mining by a fifth (19.1%) and declined by a little less than a third (29.5%) of the respondents.

The respondents said that apartment prices and rents had risen because of mining: 'The selling prices and rents of apartments and business premises have become enormous.' High housing costs were not seen to correlate with the quality of the apartments: 'Renting in the area is quite expensive considering that the apartments are often old and the structures and surfaces have not been renovated.' Expensive housing even came up as a hindrance to moving to the locality: 'People rather commute to Sodankylä than bring their families here because of the high level of rents.' Considering property, the greatest dissatisfaction was caused by their small size. As one respondent crystalised the problem: 'The municipality zones lots that are too small. Who would want to live in the countryside and read the newspaper through the neighbour's kitchen window?'

Concerning the impacts of mining on the services and attractiveness of Sodankylä, the greatest difference to the previous study is in the increased share of negative assessments and the decreased share of those who did not perceive any impacts. On every item, the share of respondents who experienced the impacts as negative has increased.

3.2 Regional effects on services and attractiveness

The effects of mining on services and the attractiveness of Sodankylä were analysed regionally in order to uncover regional differences in the experienced benefits and disadvantages. The regional analysis shows that the respondents living in the municipal centre saw the impacts of mining more positively than those living in the nearby villages and the other villages.

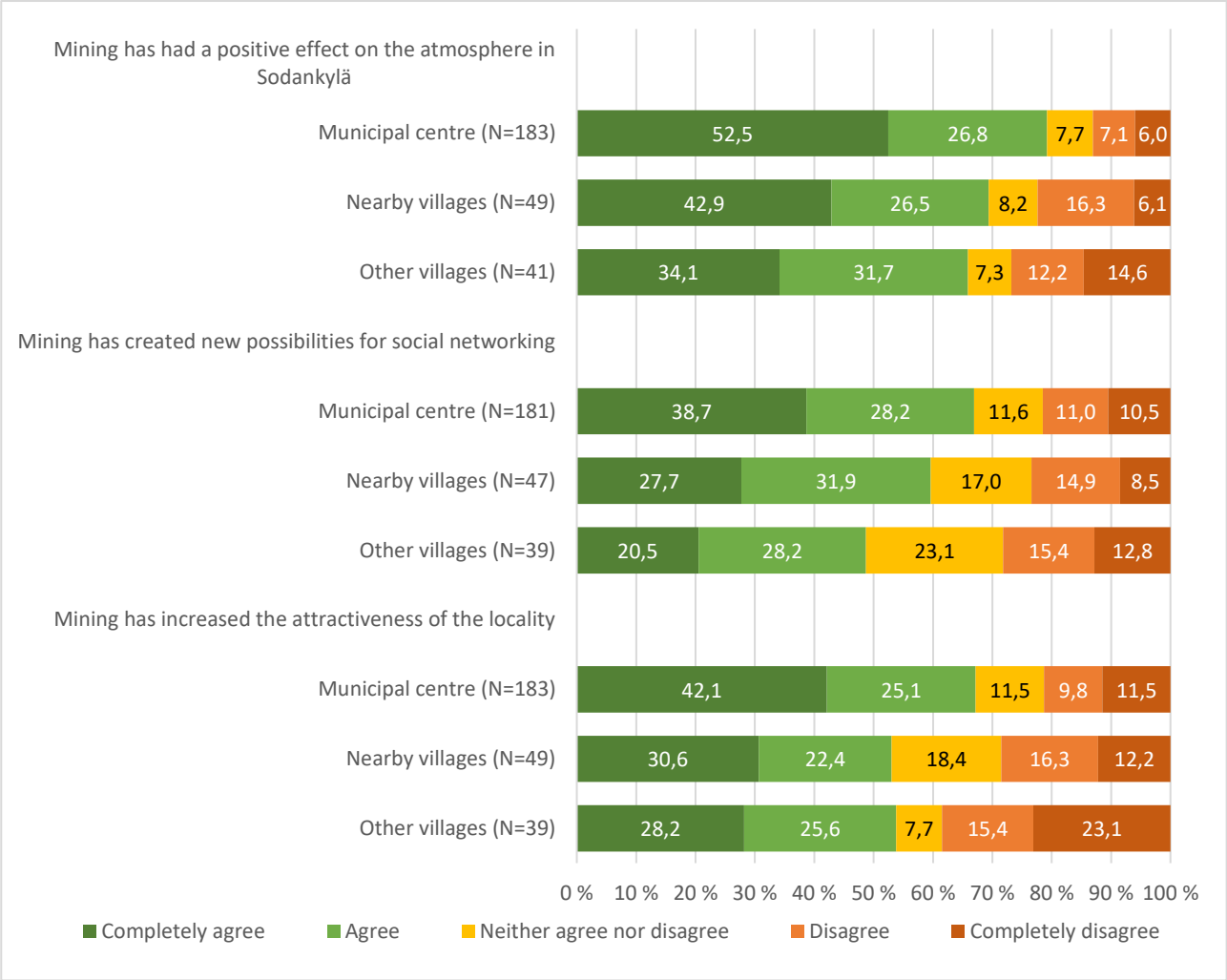

Figure 8 Impacts on the atmosphere and social networks

Regarding the impact of mining on the atmosphere of the locality, the most satisfied respondents were those living in the municipal centre (79.3%). The majority of respondents living in the villages also thought that mining had positively affected the local atmosphere (nearby villages 69.4%, other villages 65.8%). Although the impact was mostly considered positive, there were differing views as well. Over one-fifth (22.4%) of the respondents in the nearby villages and more than a fourth (26.8%) of those in the other villages thought that mining had not improved the local atmosphere. In the case of the nearby villages, this means a clear increase in the share of negative assessments, as in the 2018 study only fewer than every tenth (8.5%) respondent thought that mining had not improved the local atmosphere. In addition, compared to the previous survey, fewer respondents living in the nearby or other villages felt that the atmosphere had improved as a result of mining. In both groups the decrease was 9 percentage points.

The attractiveness of the locality was seen to have improved because of mining by two-thirds (67.2%) of the respondents in the municipal centre, while a fifth (21.3%) thought the opposite. Of the respondents living in the villages, slightly more than half felt that mining had improved the locality's attractiveness (nearby villages 53.0%, other villages 53.8%), while slightly over every fourth (28.5%) respondent in the nearby villages and almost two-fifths (38.5%) of the respondents in the

other villages thought the opposite. Compared to the year 2018, a larger share of respondents living in the villages felt that the attractiveness had not improved because of mining. Their share increased by 13 percentage points in both the nearby and the other villages, which in the case of the nearby villages means that the share almost doubled.

The respondents predominantly felt that mining had created new opportunities for social networking. Over half of the respondents living in the municipal centre and in the nearby villages and almost half of the respondents living in the other villages felt that social opportunities had increased because of mining (municipal centre 66.9%, nearby villages 59.6%, other villages 48.7%). The views on social networking opportunities did not change much from before, except for an increased share of negative assessments by respondents living in the other villages. In 2018, every fifth (20.0%) respondent in the other villages thought that mining had not improved social networking opportunities, which is 8 percentage points less than in the current study. Although a smaller share of respondents than before felt that they had good social networks in the area, the impact of mining on social networking was experienced in a somewhat similar way as previously.

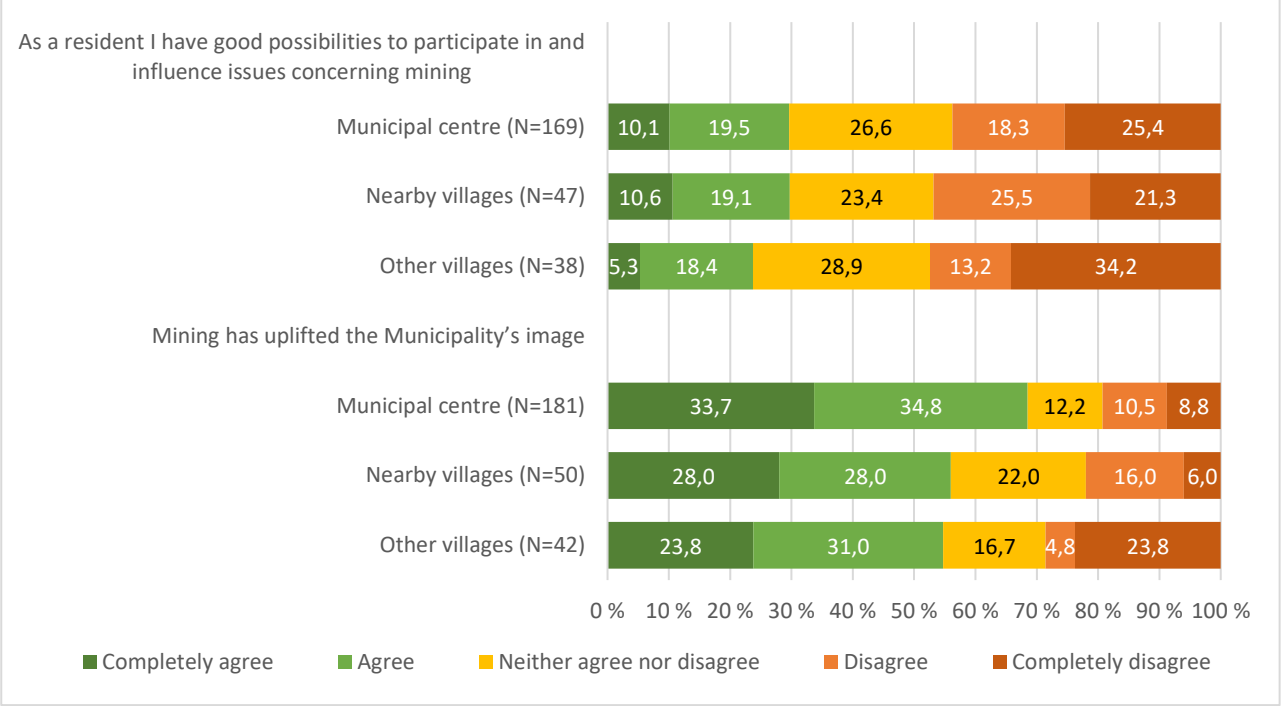

Figure 9 Impacts on the image of Sodankylä and the possibilities of the locals to participate

The effects of mining on the municipality's image were mostly considered positive. Especially respondents living in the municipal centre felt that mining had improved the municipality's image, but also over half of the respondents living in the villages deemed the effects positive (municipal centre 68.5%, nearby villages 56.0%, other villages 54.8%). However, the assessments of the effects of mining on the image of the municipality were more negative than before regardless of the place of residence. The change was greatest in the views of respondents living in the villages. Compared to the 2018 study, the share of respondents who felt that the municipal image had improved as a result of mining decreased by 17 and 10 percentage points in the nearby villages and the other villages, respectively.

The municipal residents' opportunities to participate in and influence mining-related issues were deemed weak. Only less than a third of the respondents living in either the municipal centre or the nearby villages and less than a fourth of respondents living in the other villages felt that they had good opportunities to participate and influence (municipal centre 29.6%, nearby villages 29.7%, other villages 23.7%). Respondents living in the villages assessed their opportunities for participation and influencing to be much weaker than in 2018, when slightly less than a half (46.5%) of the respondents in the nearby villages and fewer than every third (30.0%) of those in the other villages felt they had good opportunities to participate in and influence issues concerning mining. The extensiveness and complexity of the issues being decided were seen as the reason why participation and influencing had become more difficult. Keeping up with the mining projects was felt to be time-consuming and requiring expert knowledge. As one respondent put it: 'What can we say offhand about a thousand-page environmental impact assessment report, for example. All of a sudden one would have to have expertise on god knows what to be able to assess the things that affect us.'

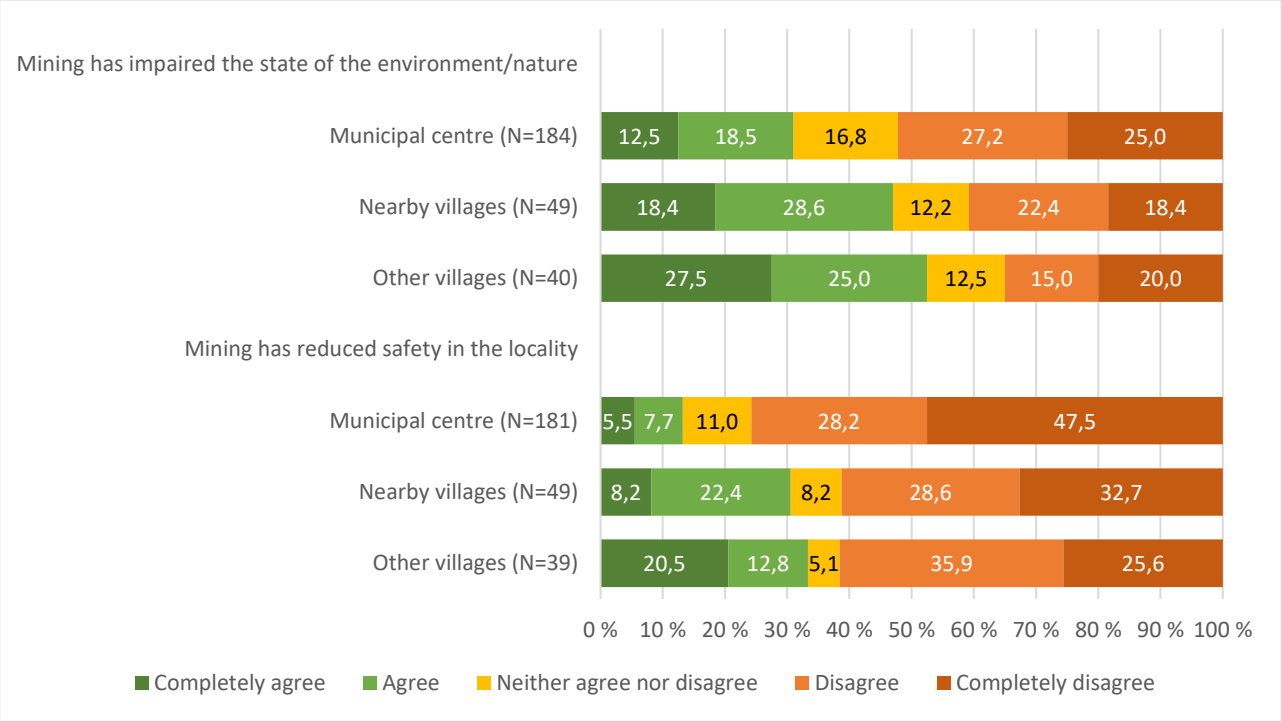

Figure 10 Impacts on nature and safety

The state of the environment was considered impaired as a result of mining by less than a third of the municipal centre respondents, slightly less than a half of the respondents in the nearby villages and a little more than a half of those in the other villages (municipal centre 31.0%, nearby villages 47.0%, other villages 52.5%). Environmental nuisances were experienced less than previously regardless of the place of residence, but the differences were greatest among the respondents living in the municipal centre and in the nearby villages. In 2018, over two-fifths (41.6%) of the municipal centre respondents and almost three fifths (57.6%) of the respondents in the nearby villages felt that mining had impaired the state of the environment. In the other villages, the share of those who

assessed that mining had impaired the state of the environment decreased by 3 percentage points compared to the previous study.

The safety of the locality was considered to have reduced because of mining by a little more than a tenth (13.2%) of the municipal centre respondents, slightly less than a third (30.6%) of the respondents in the nearby villages and a third (33.3%) of those in the other villages. Compared to 2018, over twice as big a share of respondents living in either the nearby villages or the other villages felt that safety had reduced as a result of mining (2018: nearby villages 13.7%, other villages 15.0%).

Considering the impacts of mining on the services and the attractiveness of the locality, the largest difference between the two latest studies is the increased share of critical assessments made by respondents living in the nearby villages and the other villages. On almost every item, the respondents in the villages saw that the effects were more negative or significantly more negative than in 2018.

3.3 Environmental impacts

Mining-related environmental concerns are the main reason for public opposition of mining projects. In Finland as well as internationally, especially impacts on bodies of water and water resources management raise concerns amongst citizens (e.g. Mononen 2016). In order to see how the local people's experiences of mining projects change over the years, it is important to study their perceptions of environmental impacts of mining. Cumulative impacts refer to the long-term effects of one project or the combined effects of several different projects (Franks et al. 2010).

The environmental impacts of mining were analysed regionally by grouping the respondents into three groups based on the place of residence: the municipal centre, the nearby villages and the other villages. The regional analysis shows that respondents living in the nearby and other villages experienced more environmental nuisances than respondents living in the municipal centre. On the whole, compared to the 2018 study, a smaller share of the respondents perceived adverse environmental impacts regardless of the place of residence. The predominantly perceived adverse impacts were the same as in the previous study: mining was seen as a source of reduced road traffic safety and unwanted changes in the landscape. Adverse impacts on bodies of water wild animals, plants and the recreational use of nature were also perceived. The most unfrequently experienced adverse impacts were smell, tremor, lighting of the mines and hazardous chemicals, which were all perceived by clearly less than a half of the respondents.

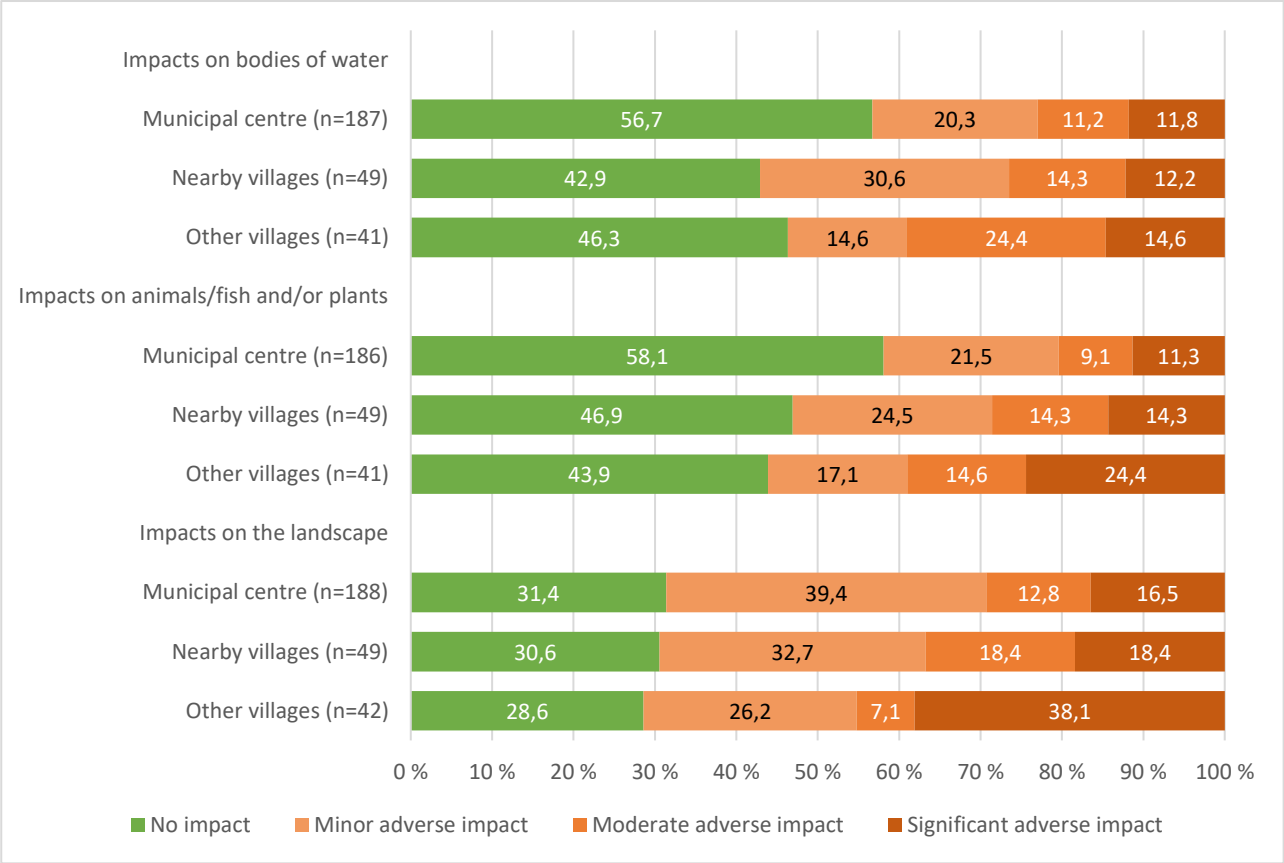

Figure 11 Impacts on natural environments

Unwanted impacts on the landscape were perceived by more than two-thirds of the respondents regardless of the region (municipal centre 68.6%, nearby villages 69.4%, other villages 71.4%), which is a little less than in 2018 when three out of four respondents said that mining had caused unwanted landscape effects (municipal centre 76.0%, nearby villages 75.9%, other villages 75,0%). The respondents were also concerned over the impacts on bodies of water, wild animals, fish and plants. Over a half of the respondents living in the villages and more than two-fifths of the respondents living in the municipal centre had perceived adverse impacts on the bodies of water (municipal centre 43.3%, nearby villages 57.1%, other villages 53.7%). Adverse impacts on wild flora and fauna were also perceived by more than a half of the respondents living in the villages, while a little over two-fifths of the respondents living in the municipal centre had the same perception (municipal centre 41.9%, nearby villages 53.1%, other villages 56.1%). The respondents felt that the bodies of water have become polluted and fish populations have reduced. The respondents also worried about possible future adverse environmental impacts and their effect on the local nature and fauna. On average, adverse impacts on the landscape, natural environment and flora and fauna were perceived by roughly a half of the municipal centre respondents and three-fifths of the respondents in the villages (municipal centre 51.3%, nearby villages 59.9%, other villages 60.9%).

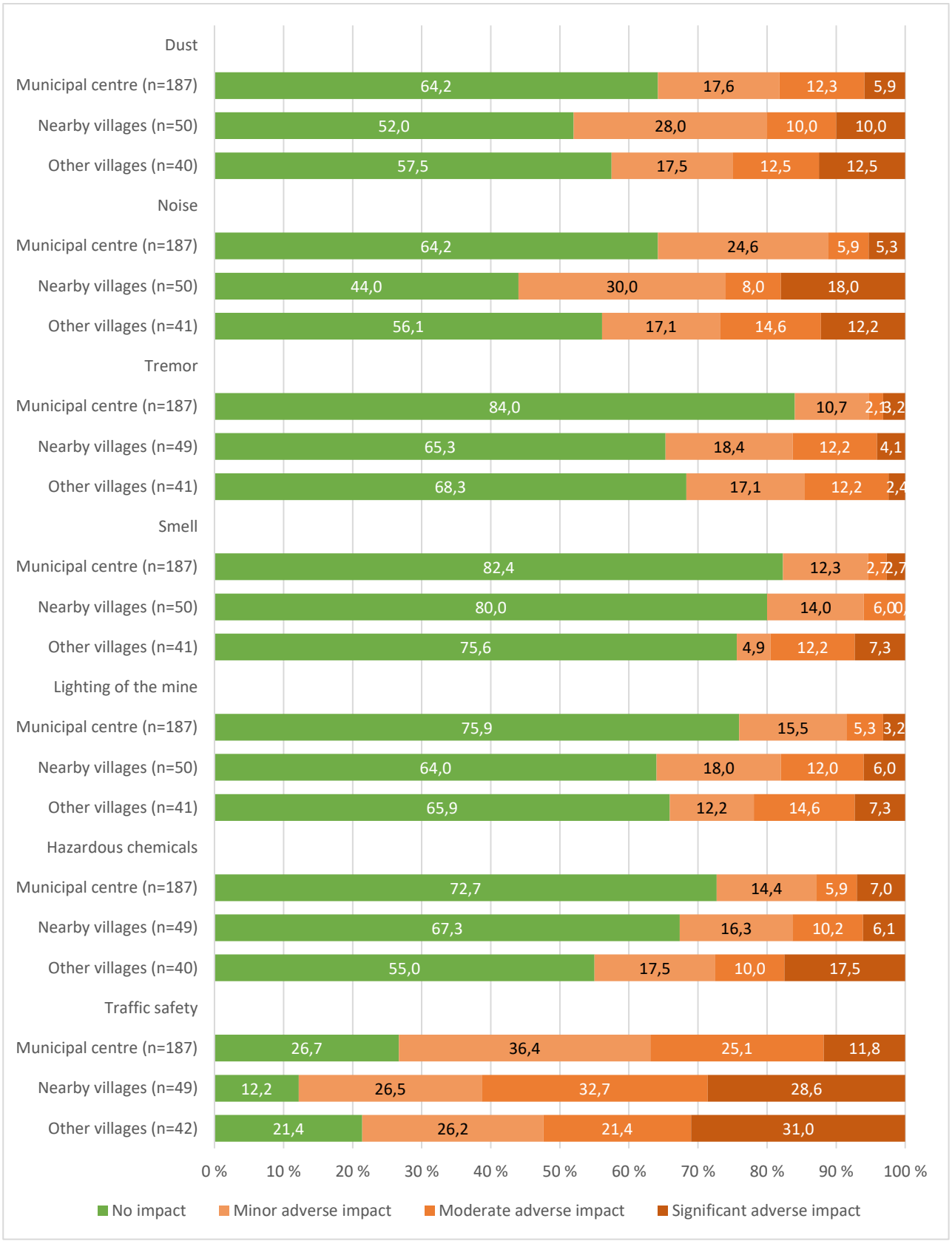

Figure 12 Impacts related to the operations of the mines

A vast majority of the respondents felt that road traffic safety had decreased because of mining. This was most often experienced by those living in the nearby villages, with 88 percent of the

respondents reporting that traffic safety had decreased. Also, a majority of the respondents in other villages (78.6%) and the municipal centre respondents (73.3%) felt that traffic safety had declined. Compared to the previous study, a slightly larger share of the respondents living in the nearby villages thought that road traffic safety had reduced, while among the respondents living in the municipal centre or the other villages, the change was opposite. Increased heavy vehicle traffic was seen as a cause for the decreased safety. Mining-related commuter traffic was also named as a factor that has negatively affected safety on the roads: 'commuter traffic to the mine compromises the safety on E75 because the workers are in the habit of speeding.' The lack of walkways and bike paths along heavily used stretches of road was seen as a safety risk: 'Biking and walking along the E75 during winter is impossible due to the increased heavy vehicle traffic, because there is not enough space on the road to safely move amidst the traffic.'

Dust was perceived as a problem by slightly over a third (35.8%) of the municipal centre respondents and a little over two-fifths of the respondents in the villages (nearby villages 42,0%, other villages 42.5%). The share of respondents reporting dust was smaller than before regardless of the place of residence. Compared to the 2018 study, the share of respondents reporting dust decreased in the municipal centre, the nearby villages and in the other villages by 23, 25 and 8 percentage points, respectively. The respondents perceived that dust from the mines was carried by the wind to the nearby villages and nature: 'During springtime the swamps are yellow with explosion fallout.'

Disturbing noise was experienced particularly in the nearby villages, with over half (56.0%) of the respondents reporting noise nuisance. Slightly over two-fifths (44.0%) of the respondents in the other villages and a little over a third (35.8%) of the municipal centre respondents had experienced disturbing noise. Noise caused by mining becomes pronounced in an otherwise quiet environment: 'Continuous noise is very disturbing and there is no natural peace to mention anymore.'

Disturbing tremor was perceived by approximately a third of the respondents living in the villages (nearby villages 34.7%, other villages 31.7%). Only a sixth (16.0%) of the respondents living in the municipal centre reported tremor, which is less than a half of the corresponding share in the 2018 study (34.7%). Lighting of the mine was perceived as disturbing by little over a half of the respondents in the villages, whereas in the municipal centre their share was less than a fourth (municipal centre 24.1%, nearby villages 36.0%, other villages 34.1%). Adverse impacts related to hazardous chemicals were perceived by slightly more than a fourth (27.3%) of the municipal centre respondents, a little less than two-fifths (37.3%) of the respondents in the nearby villages and little less than a half (45.5%) of those in the other villages.

Adverse impacts related to the operations of the mines, such as dust, noise and lighting, were perceived on average by slightly over a half of the respondents in the municipal centre and less than two-fifths of the respondents in the villages (municipal centre 26.1%, nearby villages 37.9%, other villages 36.9%).

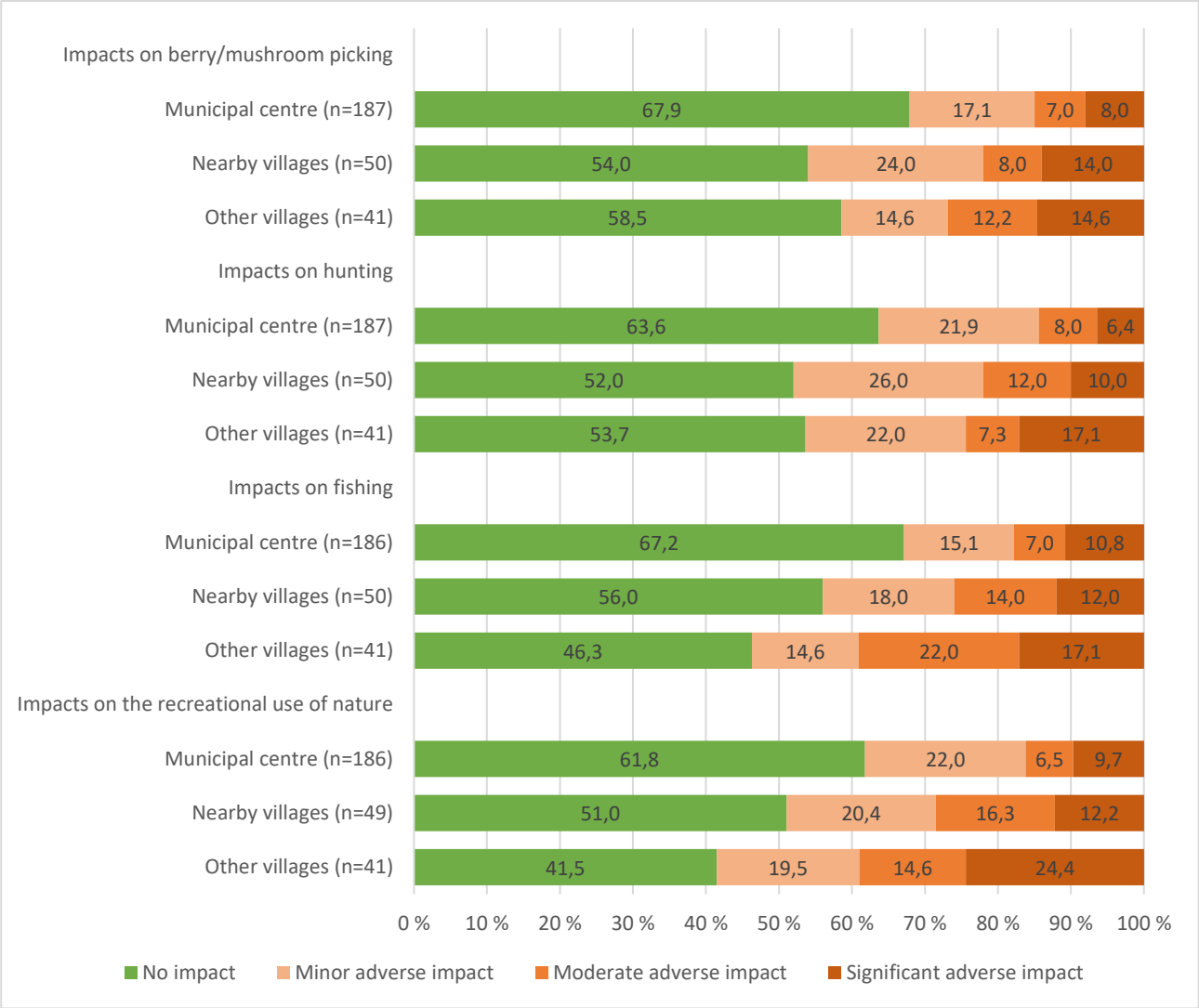

Figure 13 Impacts on recreational and utility use of nature

The impacts of mining on berry and mushroom picking were considered negative by slightly less than a third (32.1%) of the municipal centre respondents, less than a half (46.0%) of the respondents in the nearby villages and roughly two-fifths (41.8%) of those in the other villages. As regards the municipal centre and the nearby villages, the situation improved compared to 2018, when adverse impacts on berry and mushroom picking were experienced much more often (municipal centre 42.1%, nearby villages 59.6%). Areas lost to mining and dust from the mine were seen as factors adversely affecting the picking of natural produce.

Adverse impacts on hunting were perceived most often by the respondents living in the villages, as almost half of them reported that mining had hindered hunting (nearby villages 48.0%, other villages 46.3%). In the municipal centre, 36 percent of the respondents had experienced that mining had adversely impacted hunting. Mining-related land use was also mentioned in conjunction with hunting: 'A good elk hunting area was lost when the Kevitsa mine was founded.' Drillings and larger areas claimed for mining were brought up as factors that have a negative impact on mining.

Adverse impacts of mining on fishing were experienced by over a half (53.7%) of the respondents in the other villages, over two-fifths (44.0%) of those in the nearby villages and a third (32.8%) of the municipal centre respondents. The share of respondents who perceived negative effects on fishing decreased in the municipal centre and the nearby villages (2018: municipal centre 39.5%, nearby villages 55.9%) but increased in the other villages (2018: 45.0%). The impacts of mining on the bodies of water and adverse effects on fishing were linked in the open-ended answers: 'The emissions to the bodies of water have affected for example fishing which is our recreation and a way to acquire food.'

Negative impacts of mining on the recreational use of nature were perceived by nearly three-fifths (58.5%) of the respondents living in the other villages and by roughly a half (49.0%) of the respondents living in the nearby villages. Two-fifths (38.2%) of the municipal centre respondents felt that mining had adversely impacted the recreational use of nature.

On average, adverse impacts of mining on recreational and utility use of nature were experienced by a third (34.9%) of the municipal centre respondents, slightly less than a half (46.7%) of the respondents in the nearby villages and by a half (50.0%) of the respondents in the other villages.

3.4. Impacts on other livelihoods

When asked about the impacts of mining on other livelihoods, a significant majority (89.1%) of the respondents estimated that trade had benefited from mining. However, forestry and agriculture were largely seen as unaffected by mining.

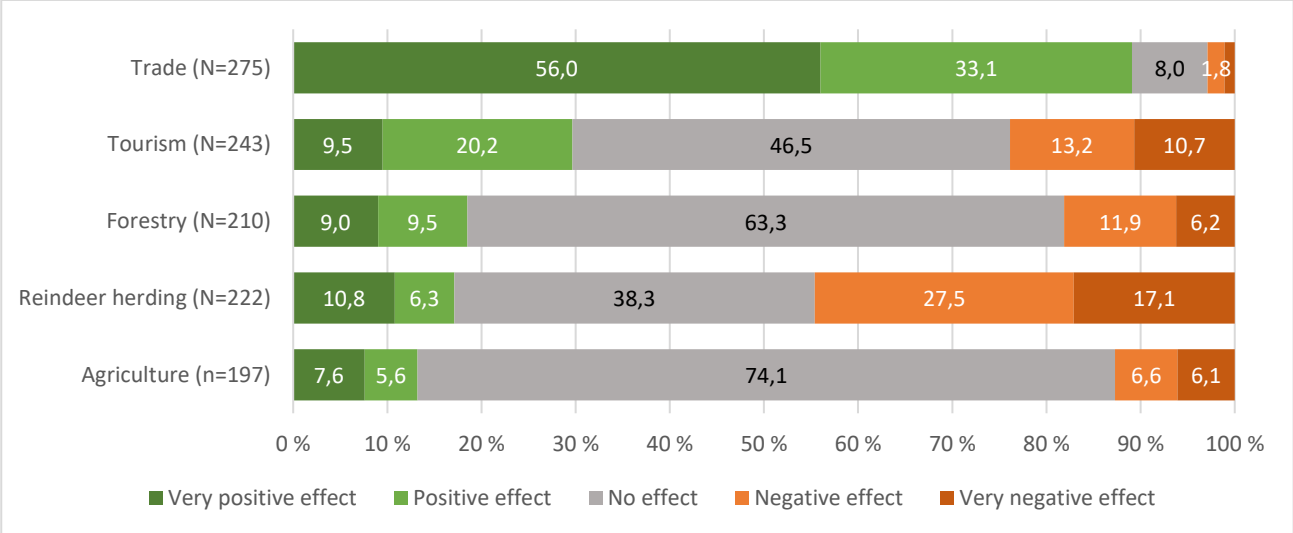

Figure 14 Impacts on other livelihoods

A little less than a third (29.7%) of the respondents thought that mining had benefited tourism, while slightly less than every fourth (23.9%) respondent thought the opposite. However, nearly a half (46.5%) of the respondents thought that mining had not impacted tourism at all. The most important tourism centre in Sodankylä, Ski Resort Luosto, is located tens of kilometres away from the large-scale mining projects, which means that their impact on tourism is quite small.

As in the previous studies, reindeer herding was thought to suffer the most because of mining. Over two-fifths (44.6%) of the respondents saw that mining had adversely impacted reindeer herding in the area. On the other hand, a little more than every sixth (17.1%) respondent thought that mining had benefited reindeer herding, which is almost twice the share of respondents who thought similarly in 2018 (8.9%). However, all the respondents whose primary livelihood is reindeer husbandry saw mining as a hindrance to reindeer herding and as a threat to the traditional livelihood. According to them, large natural grazing lands needed by reindeer decrease in size because of mining-related land use, and this was considered a problem: 'The land overtaken by mining is taken away from reindeer herding, and if you look at land use in general, are there any places left for reindeer to go to?'

The dependency of reindeer herding on clean nature was also brought up: 'The way of life, the livelihood and the culture are under a threat. In the future, there may not be nature left and therefore reindeer herding cannot continue.'

4 Acceptability of mining in Sodankylä

4.1 Acceptability of mining

Over a half (53.1%) of the respondents completely accepted mining in Sodankylä. In the open-ended answers it was stated for example that 'Mining is the foundation of the welfare of the municipality of Sodankylä' and 'Mining saved Sodankylä. Without mining this would be a dead village.' Mining was also a source of 'positive future hopes' and many respondents believed that the mines have a positive impact on Sodankylä's development. Approximately a fourth (24.5%) of the respondents accepted mining in Sodankylä a bit more conditionally. As one respondent stated: 'Mining is an opportunity for Sodankylä. But only if the mining companies put the environment and social matters first.' Compared to the previous study, the acceptability of mining in Sodankylä decreased by about 7 percentage points (2018: 85.0%) bringing it to the same level as in 2016, when 80 percent of the respondents accepted mining in the area.

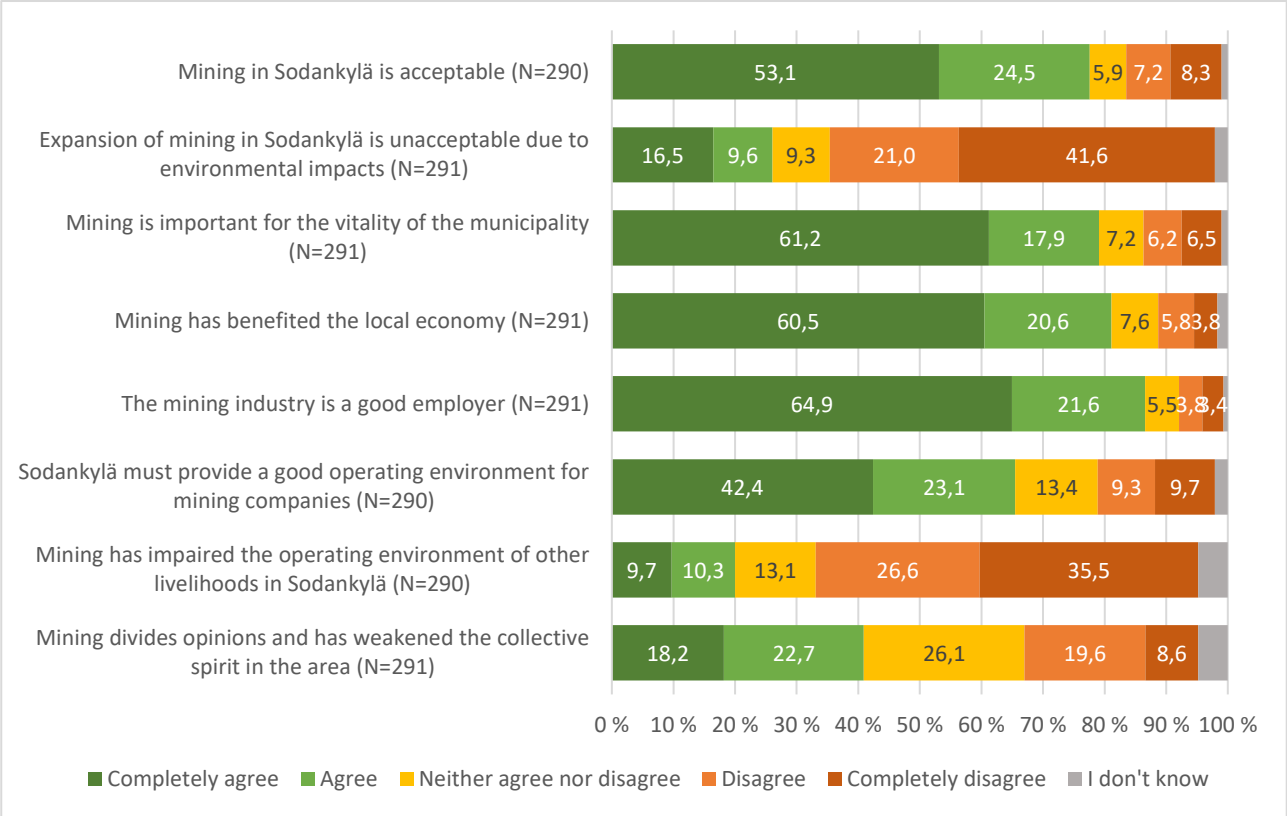

Figure 15 Acceptability of mining in Sodankylä

Four out of five respondents felt that mining is important to the vitality of the municipality (79.1%) and thought it had benefited the local economy (81.1%). When assessing the impacts, the respondents often compared the current situation to an alternative one in which there would not be any mines in Sodankylä: 'Without the mine the village streets would be devoid of young and working age people.' Vitality and the economy become entwined in the population: 'Mining has brought new jobs, residents and families to the village and thus invigorated the life in the municipality.'

A majority (86.5%) of the respondents thought that the mining industry is a good employer and two out of three (65.5%) thought that Sodankylä should provide a good operating environment for the mining companies. A little over three-fifths (62.1%) thought that mining has not affected negatively other livelihoods, while a fifth (20.0%) thought the opposite.

When asked about the impact of mining on the collective spirit of the locality, there was variation in the answers. Two-fifths (40.9%) of the respondents felt that mining had affected the collective spirit negatively, whereas slightly over a fourth (28.2%) thought it had not caused problems by dividing opinions amongst the locals.

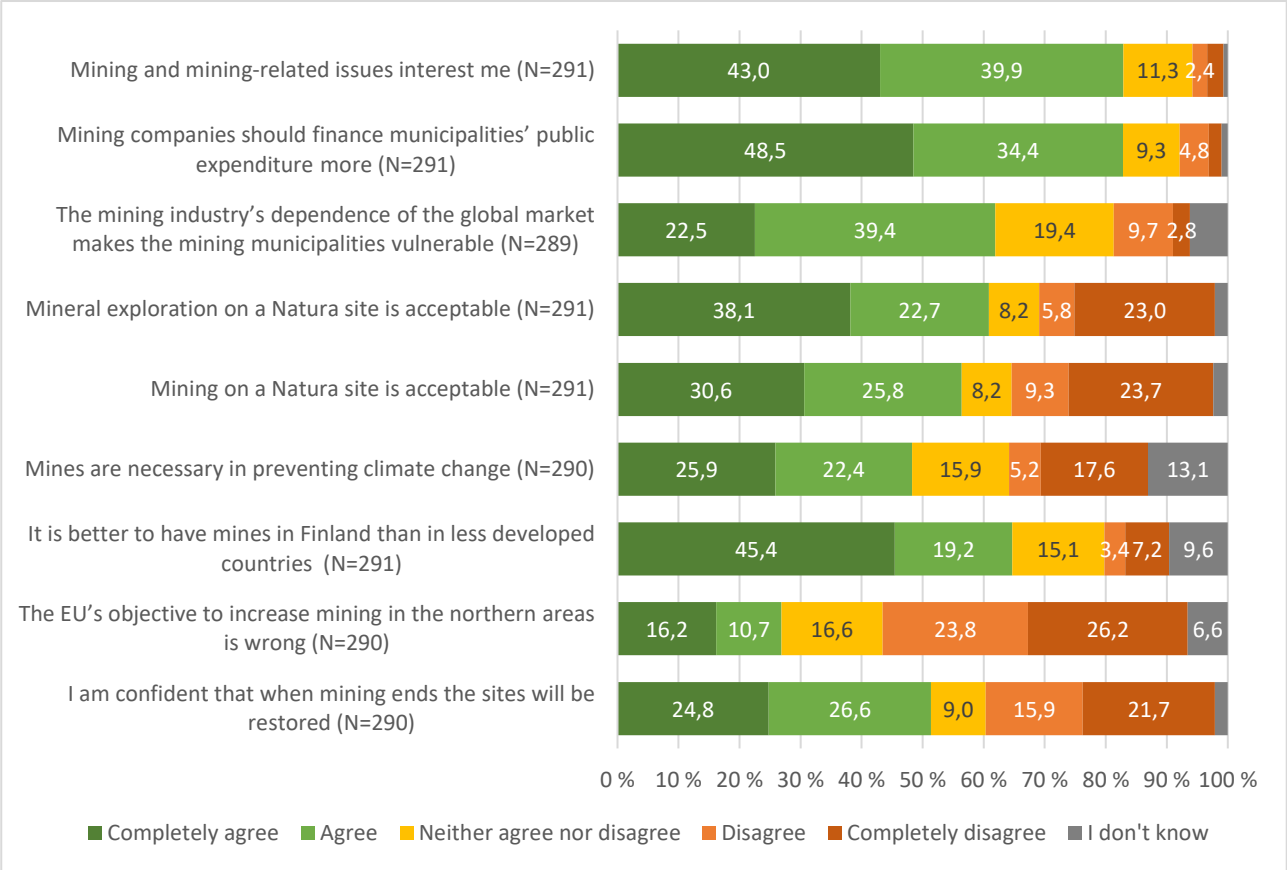

Figure 16 The general acceptability of mining

The matrix measuring the acceptability of mining was supplemented with items concerning mineral exploration, climate change, the EU and the founding of mines in less developed countries.

As in the previous study, a clear majority (82.9%) of the respondents expressed an interest in mining and issues related to it. An equal share also thought that the mining companies should finance the public expenditure of municipalities to a greater extent. A majority (61.9%) thought that the dependence of the mining industry on the global market makes mining municipalities vulnerable, but a majority (64.6%) also thought that it is better to have mines located in Finland instead of in less developed countries. The extraction of minerals was considered necessary and the location of the mines was assessed in the context of fairness as well: 'On the other hand, it is perhaps hypocritical to accept mining somewhere in South Africa and reject it on one's own backyard. The current way of life demands metals, so in that sense it may have to be accepted here as well.'

A little over a fourth (26.9%) of the respondents thought that the EU's objective to increase mining in the northern areas is wrong, while a half (50.0%) of the respondents did not view the objective as problematic.

Mineral exploration and mining on Natura sites were accepted by three-fifths (60.8%) and by over a half (56.4%) of the respondents, respectively. A little less than a third rejected exploration and mining on Natura sites (exploration 28.8%, mining 33.0%). One reason behind the opposition is a concern over losing natural values in the protected areas: 'If they start digging under the Natura site, the nature will lose the battle. The last wilderness areas in Europe and the virginal nature are

a million times more valuable than mining.' There was variation in the answers to the question concerning the aftercare of the mining sites. Slightly over a half (51.4%) of the respondents trusted that the sites will be restored after the mining ends, while almost two-fifths (37.6%) had suspicions about proper aftercare. Roughly a half (48.3%) of the respondents saw mines as useful in the prevention of climate change, less than a fourth (22.8%) thought the opposite and slightly over a tenth (13.1%) chose the option 'I do not know'.

4.2 Regulatory control and participation in decision making

The matrix measuring regulatory control and decision making was also developed further. One item, 'the decision-making process of mining project is clear', was removed and items concerning communication by the authorities and the appeal process were added. The item 'I know how the mining industry works' was also added.

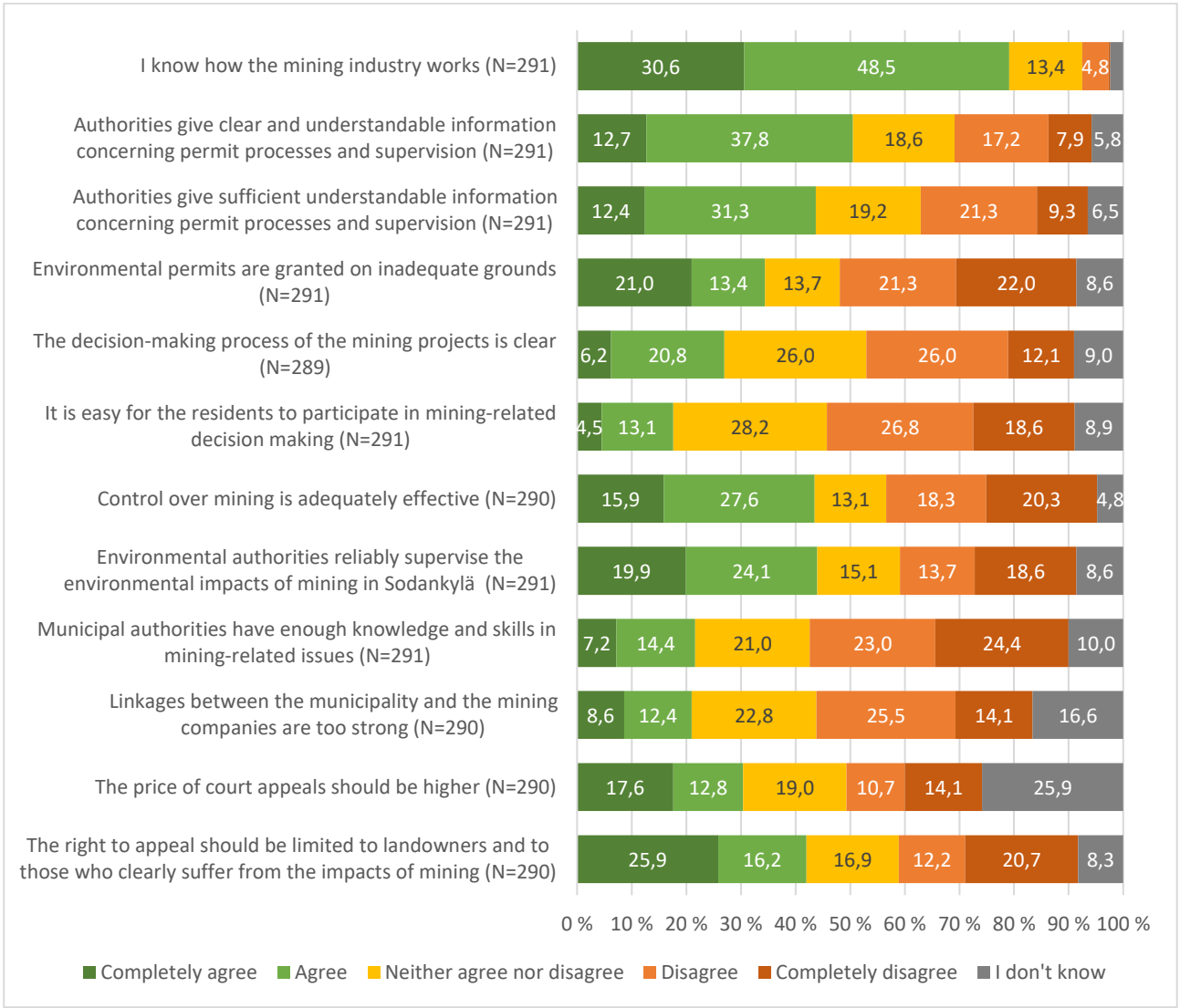

Figure 17 Regulatory control and decision making

The respondents were very familiar with the mining industry. Four out of five (79.1%) respondents said that they know how the mining industry works. Despite the familiarity, the respondents wished for more information about the local mines: 'it would be nice to hear everyday things of the mine

in Sompio for example, so that the mine and those working there would become more familiar and that we could see the activities involved in running a mine, because now the mine is quite a distant operator.'

Information concerning permit processes and supervision given by authorities was deemed clear by half (50.5%) and sufficient by two-fifths (43.7%) of the respondents. On the other hand, two fifths (43.3%) thought that the information was insufficient and every fourth (25.1%) respondent wanted more clarity to the information given by the authorities. The decision-making process of the mining projects was considered clear by a little over a fourth (27.0%) of the respondents, while almost two-fifths (38.1%) thought the opposite. For instance, the respondents wanted more information about 'environmental matters (water sample results and the like). There should also be regular communication on permit processes and regulation.'

Only slightly over a sixth (17.6%) of the respondents thought that it is easy to participate in decision making related to the mining projects, while almost half (45.5%) felt that participation is difficult. The share of those who thought that participation is difficult decreased from the previous survey (2018: 55.7%), but the results show that there clearly is a need to strengthen the municipal residents' participation in the decision making. The participation of the locals in the planning of the projects is a significant contributor to the acceptance of mining.

Slightly over a third (34.3%) of the respondents thought that environmental permits are granted on inadequate grounds, which is substantially less than the corresponding figure in the 2018 survey (43.7%). Slightly over two-fifths (43.3%) disagreed with the statement 'Environmental permits are granted on inadequate grounds', which is an increase of 5 percentage points compared to the previous study. Although trust in environmental regulation grew, it is still somewhat weak.

Control over mining was deemed sufficiently effective by 44 percent of the respondents, while 39 percent disagreed with the statement. Compared to the 2018 study, the share of those distrusting the control decreased by 8 percentage points, while the share of those who trusted it increased by 3 percentage points. Over two-fifths (44.0%) thought that the environmental authorities supervise the environmental impacts of mining reliably in Sodankylä, while a third (32.3%) were suspicious about it. In 2018, 40 percent of the respondents trusted the supervision and 39 did not.

Slightly over every fifth (21.6%) respondent thought that municipal authorities have enough knowledge of and skills in mining-related issues, while almost a half (47.4%) thought that they lack the knowledge and skills. In 2018, over a half (55.0%) felt that the authorities have insufficient knowledge of and skills in the issues. A fifth (21.0%) of the respondents thought that the links between the municipality and the mining companies are too strong, while two fifths (39.6%) thought the opposite.

Two-fifths (42.1%) of the respondents thought that the right to appeal should be limited to landowners and those who clearly suffer from the impacts of mining, while every third (32.9%) respondent was opposed to such a limitation. The respondents were more uncertain about the price of the court appeals, as every fourth (25.9%) respondent was unable to decide whether the price

should be higher. A third (30.4%) of the respondents were for and a fourth (24.8%) were against raising the price of the appeals.

4.3 Mining companies' social licence to operate

The social licence to operate refers to the societal acceptance of a project or an industry. It is not a permanent or official 'licence' in the true meaning of the word, instead rather the opposite. The social licence to operate means that a company acquires the acceptance or even the support of the stakeholders through its everyday operations. In mining, the most important group of stakeholders is the locality and its residents, because the immediate impacts of mining are often place-related, whether they are environmental or social in nature (e.g. Prno & Slocombe 2012; Prno 2013; Kokko et al. 2013; Jartti et al. 2014).

The characteristics of the locality, for example its population and economical structure, experiences of former mining operations or the political setting that reflects the values of the locals, affects how mining is initially seen. The concept of social licence highlights the fact that the actions of mining companies are extremely important to their acceptability (e.g. Kokko et al. 2013; Sairinen et al. 2016; Moffat & Zhang 2014). To measure this, the respondents were asked to assess the ongoing mining projects in Sodankylä through a varied matrix (Figure 19).

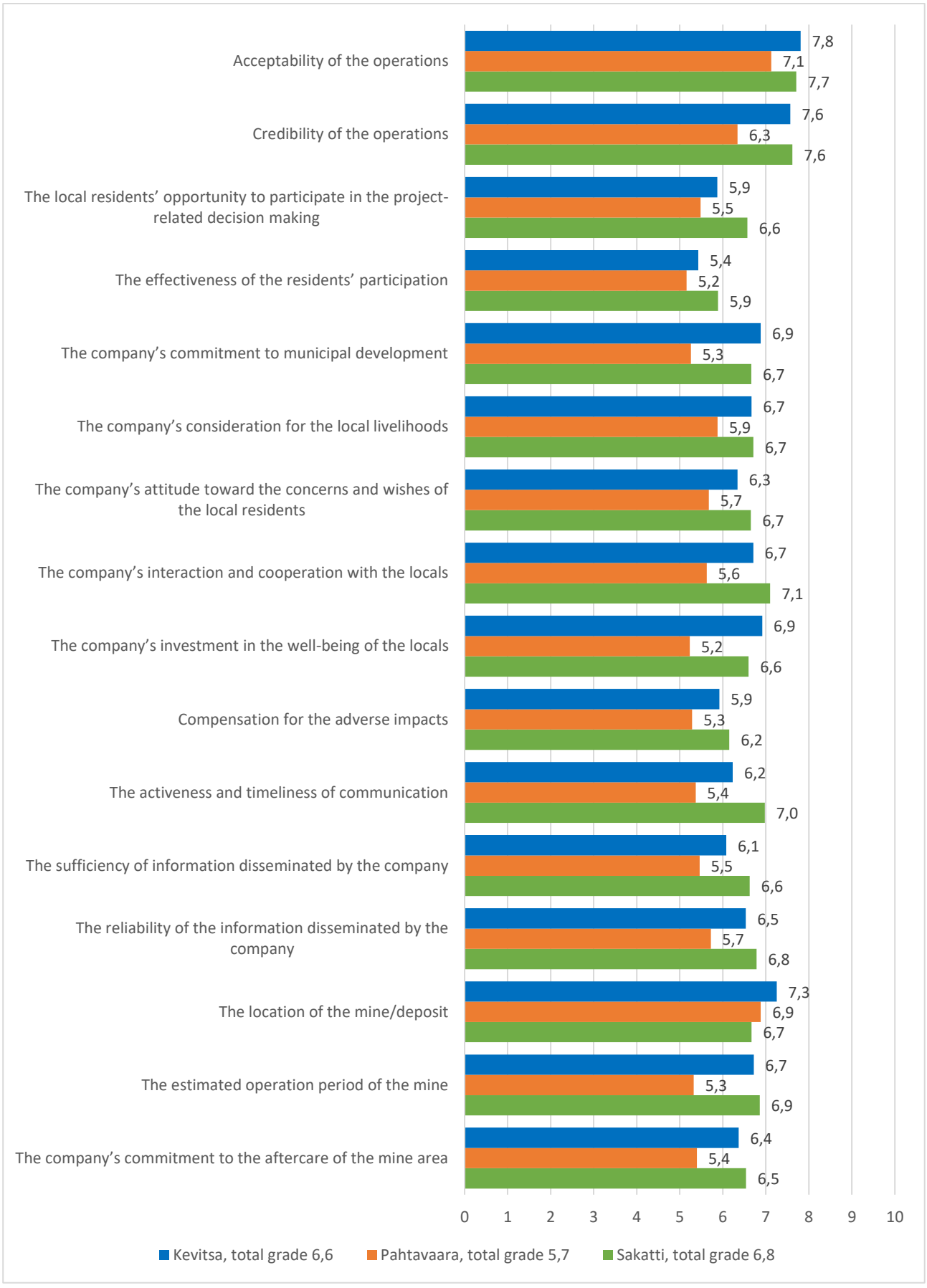

Figure 18 Project-specific assessment

The project-specific assessment was done using the Finnish school grading scale 4–10. The average scores varied between adequate (5.2) and good (7.8). In the assessment, the grades of every project dropped a little, but the differences to the previous grades are measured in tenths. As before, the total grade was fair with Pahtavaara (5.7) and satisfactory with Kevitsa (6.6) and Sakatti (6.8). The grades went up in the 2018 study, but in the current survey they returned to the level of 2016.

Every project got their highest grade for the acceptability of the company, which was satisfactory with Pahtavaara (7) and good (8) with Kevitsa and Sakatti. The lowest grades were given for the experienced effectiveness of the residents' participation, which was graded adequate with Kevitsa and Pahtavaara (5) and fair with Sakatti (6). In both previous surveys the lowest grade was given for the effectiveness of the municipal residents' participation.

Pahtavaara's second highest grade was given for the location of the mine, which was assessed to be satisfactory (7). The credibility of the operations and consideration for the local livelihoods were also graded satisfactory. Except for the location of the mine, Pahtavaara's grades were the lowest throughout the assessed fields. The strongest criticism was directed toward Pahtavaara's investment in the well-being of the locals and its commitment to municipal development, which were both graded adequate (5).

Along with the acceptability of the operations, Kevitsa was graded good (8) for the credibility of the operations as well. The location of the mine was assessed to be satisfactory (7) just as the company's commitment to municipal development and investment in the well-being of the locals. Among Kevitsa's lowest grades were the local residents' opportunity to participate in project-related decision making and compensation for adverse impacts, which were both graded fair (6).

The credibility of the operations of Sakatti was graded good (8) as well. Cooperation and interaction with the locals and the activeness and timeliness of communication were graded satisfactory (7). The strongest criticism focused on the compensation for the adverse impacts of mining and the company's commitment to the aftercare of the mine area, which were graded fair (6) and satisfactory (7), respectively.

5 Conclusion

Considering the restrictions to the generalisability of the collected data, it can be stated that the residents of Sodankylä have mainly positive views on both their home municipality and mining. The respondents felt that Sodankylä is an attractive, safe and environmentally clean place to live in, and most of the respondents had good social networks in the area. On the other hand, the respondents were markedly more critical than in 2018. Especially the atmosphere and image of the municipality and the citizens' weak opportunities to influence the municipal affairs caused dissatisfaction. The respondents viewed the impacts of mining on the locality more critically than previously, particularly the impacts on housing costs and the supply and quality of both apartments and property. The impacts on road traffic safety were also considered negative, and the environmental impacts raised concerns.

The acceptability of mining in Sodankylä is strongly connected to the impacts on the economy and employment on the one hand and to the environmental impacts on the other. The mining industry was seen as strengthening the local economy by creating jobs and a demand for products and services, thus supporting the versatility and high quality of the local supply of services. The mining industry's impact on migration and the population structure was regarded as positive, as it offers a reason for young and working age people to move to or stay in Sodankylä.

However, the positive economic effects go head-to-head with environmental risks and adverse impacts related to mining. Mining was considered important to the development and vitality of Sodankylä, but at the same time the respondents grieved over the changes in the natural environment and a concern over the realisation of environmental risks was present. Thus, the respondents called for the companies to be open and responsible about the environmental impacts of their operations.

The benefits and adverse impacts of mining are not equally distributed in Sodankylä. The adverse environmental impacts are localised mostly in the nearby villages of the projects, which is why respondents living in the villages regarded the impacts of mining as less positive than those living in the municipal centre. Furthermore, reindeer herding suffers from mining more than other livelihoods, and thus herders deemed mining as a threat to the traditional way of life and the continuation of reindeer husbandry.

Based on statistics, the respondents' expectations that mining would boost migration to Sodankylä have not been fulfilled. The population of Sodankylä has been decreasing since the 1990s, except for the years 2011–2013, when the population grew slightly. The study shows that high housing costs and the lack of apartments and attractive lots hinder migration to Sodankylä.

The respondents felt that they had poor opportunities to participate in and influence the municipal affairs and mining-related decision making. The respondents felt that the tense political atmosphere and disputes between municipal decision makers reduce the residents' opportunities to be heard. Participation in mining-related processes were considered both arduous and difficult due to the large scale and complexity of the matters being decided.

The participation of the municipal citizens is a significant factor in building acceptance towards mining. The respondents wished that the mining companies would effectively communicate and come into contact with the locals, which would help to develop open dialog between the companies and the locals, as well as offer a way for the locals to express their opinions about the ongoing or planned projects. Based on the study, having opportunities to participate in and influence local affairs affects the way the locals view their community.

Strengthening the residents' participation is important for the social licence of mining, the fair distribution of the benefits and disadvantages of mining as well as the formation of a positive perception of one's home municipality.

Sodankylä residents have shared their views of the impacts of mining though three surveys conducted by the university of Lapland. Regularly repeated follow-up studies are important tools in

keeping track of the cumulative impacts of mining – be they related to the well-being of the locals, their quality of life or the environment. Research offers information to the mining companies and the municipality for the sustainable development of the locality, and it is therefore recommendable to continue this unique chain of follow-up research.

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